

FIG.1

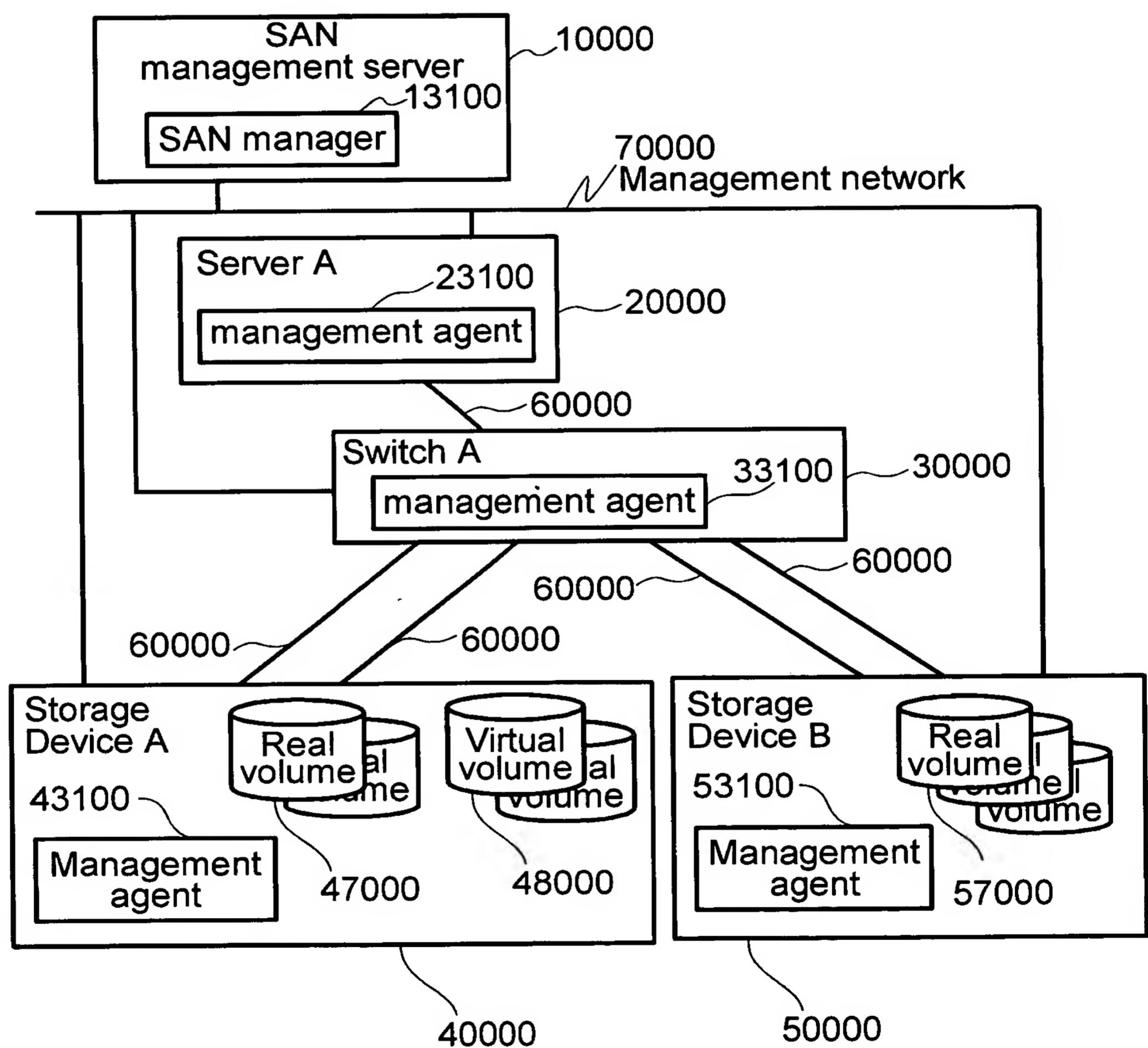


FIG.2

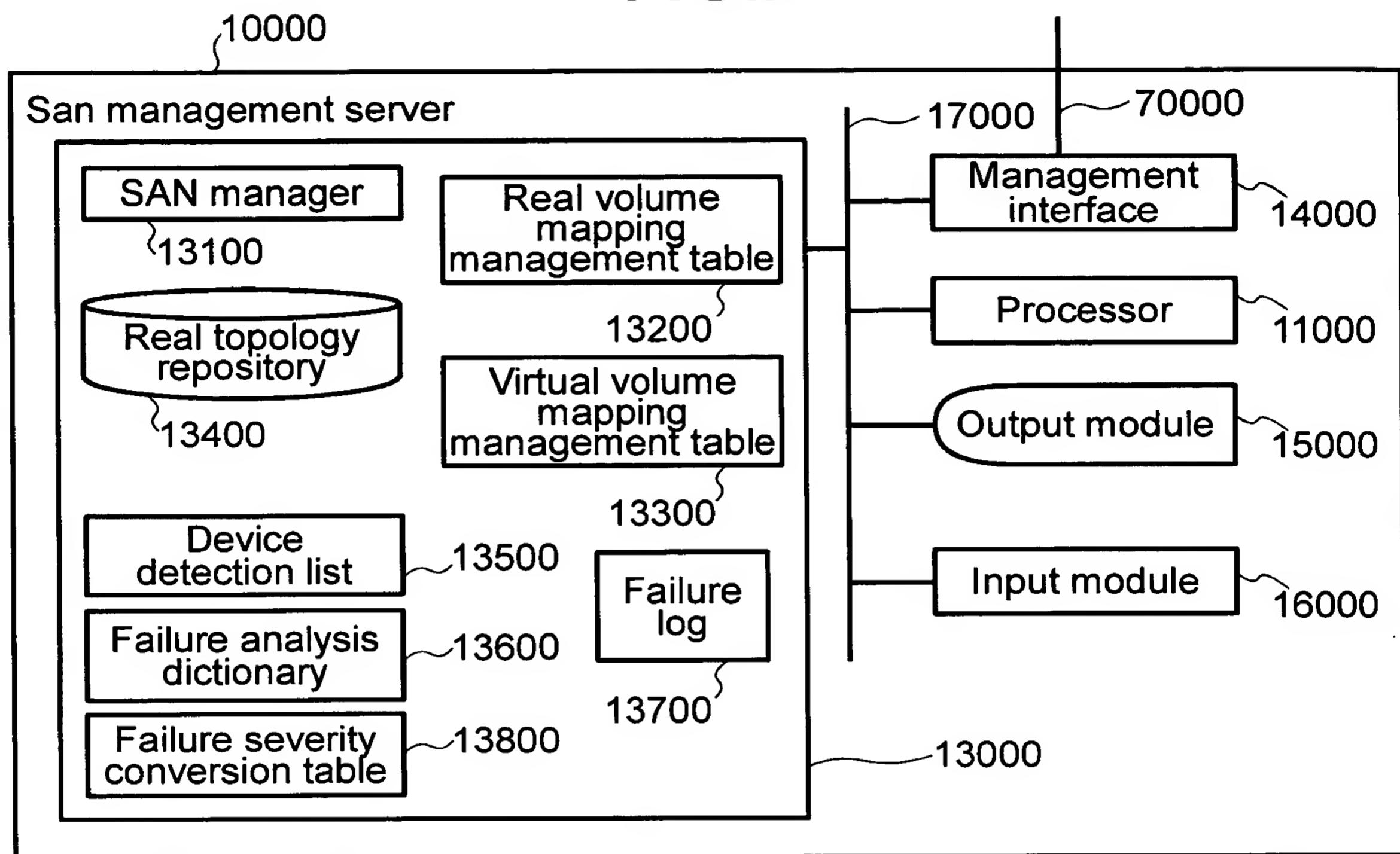


FIG.3

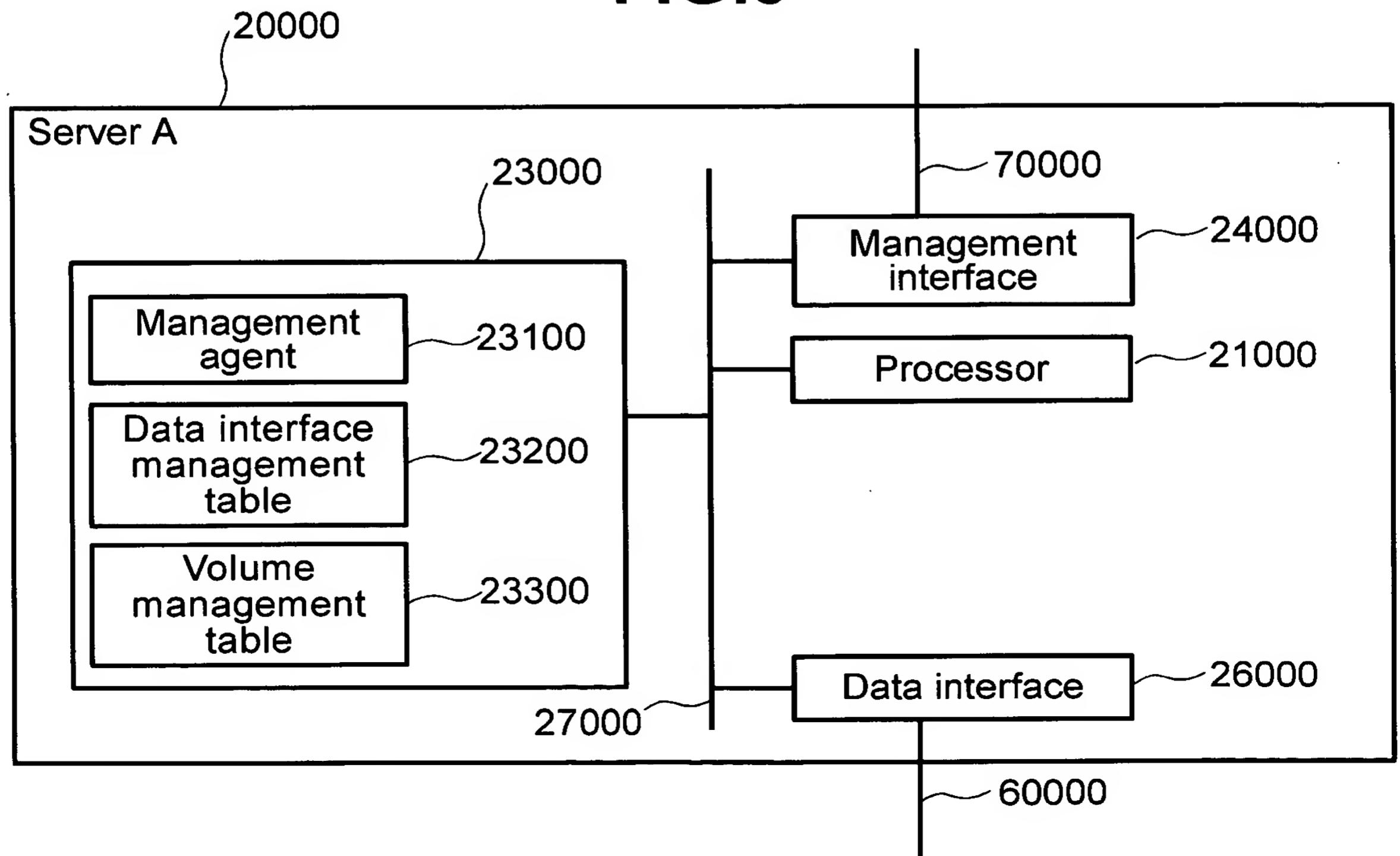


FIG.4

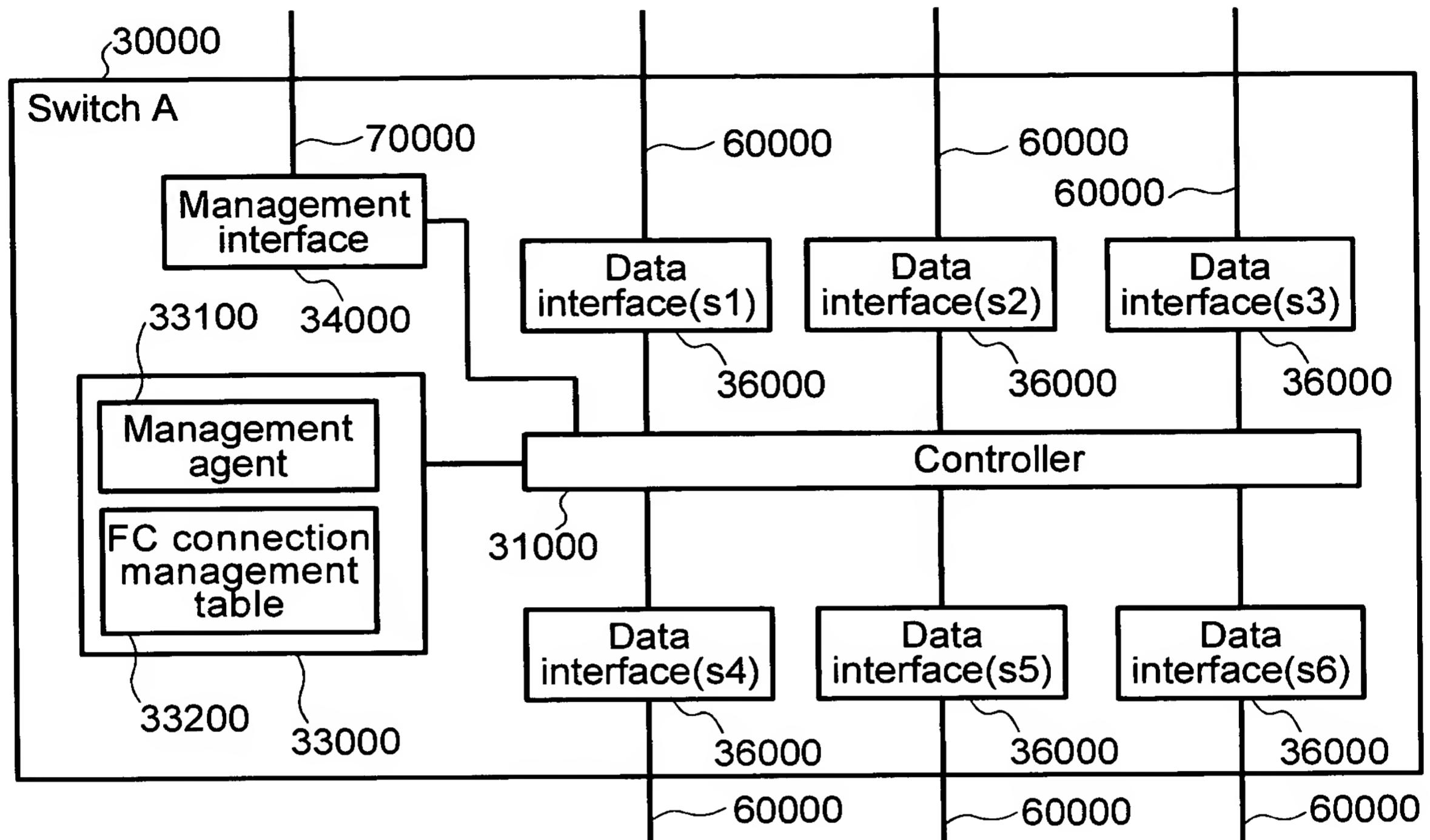


FIG.5

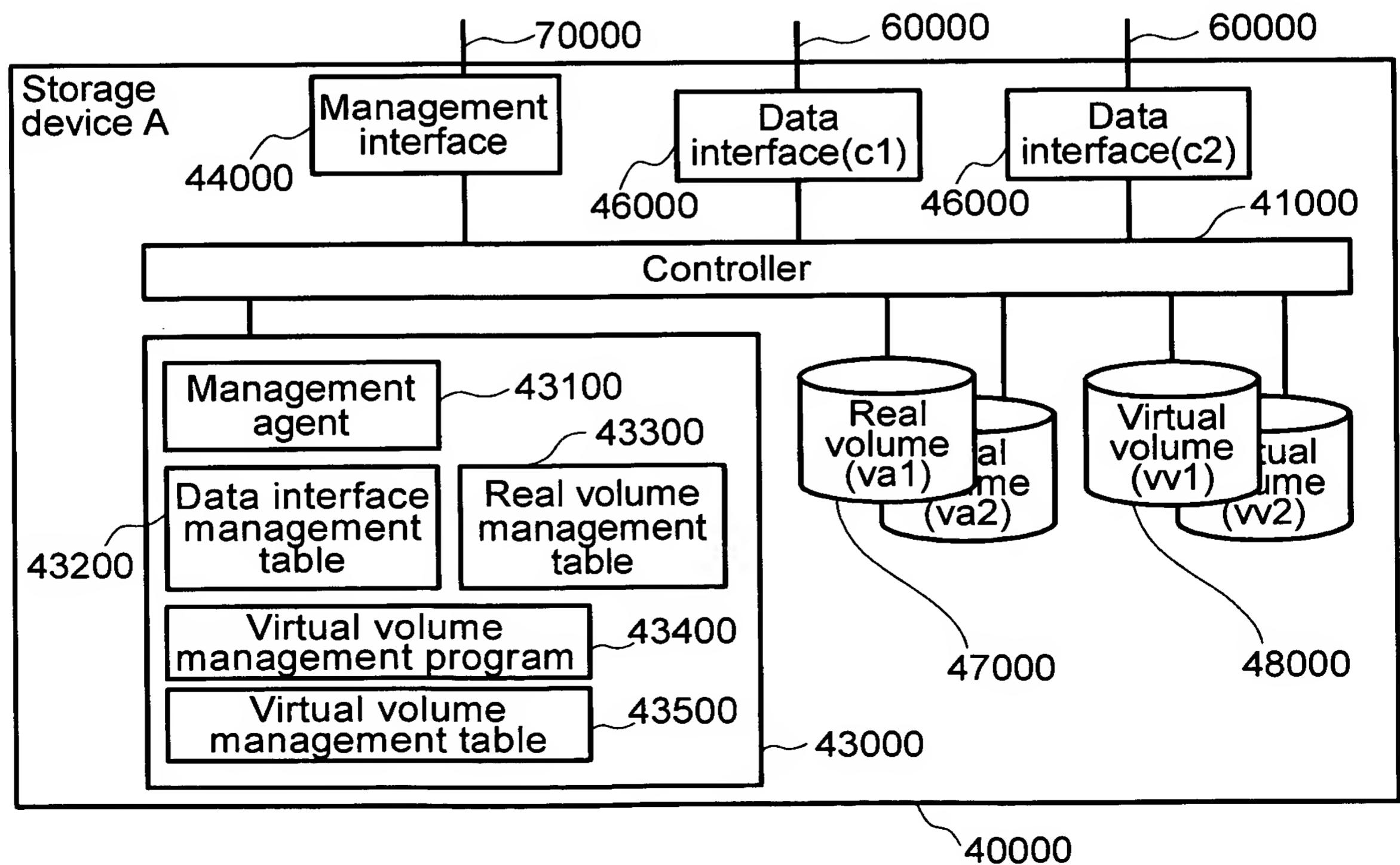


FIG.6

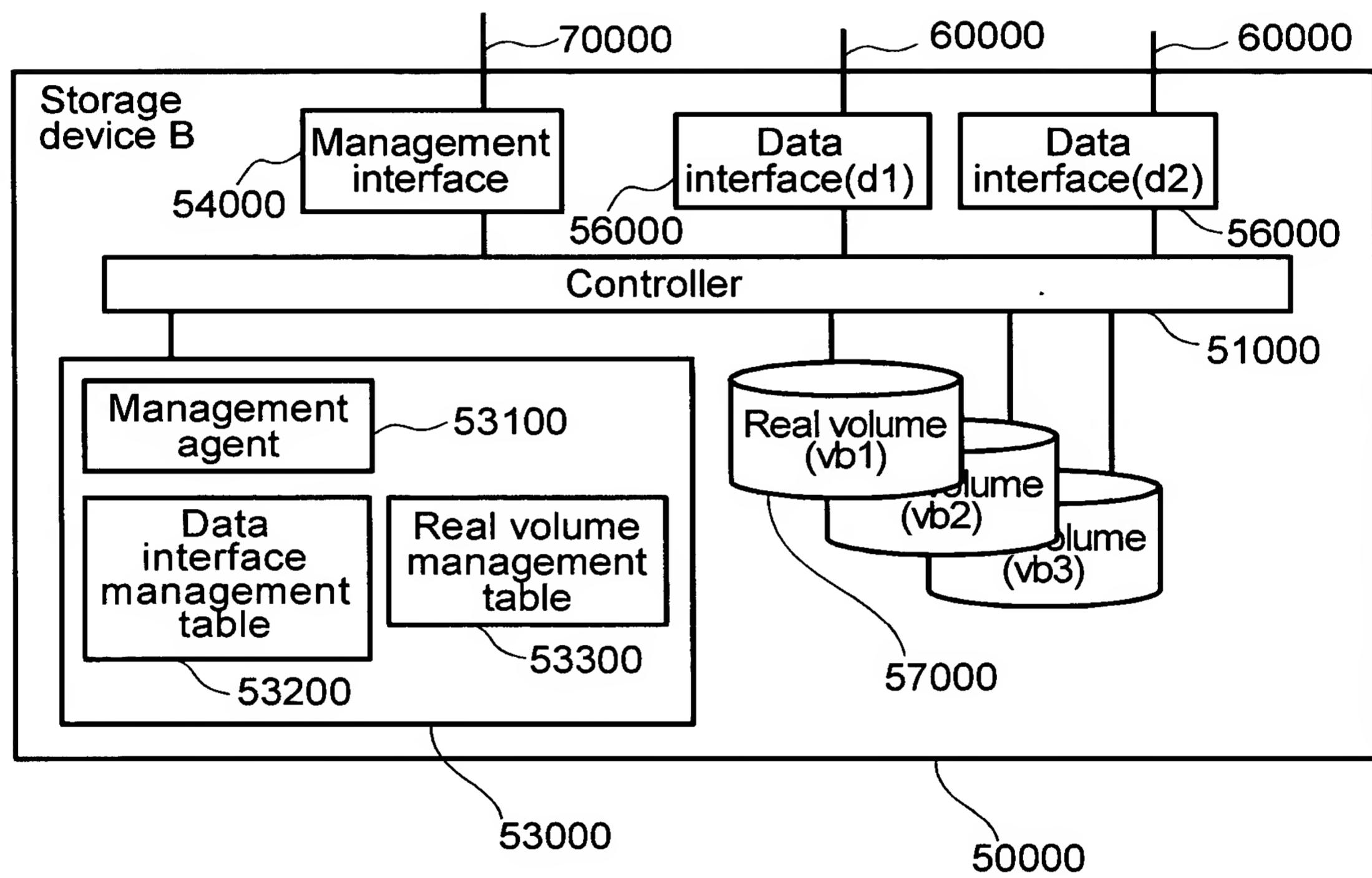


FIG.7

13200

Real mapping ID	Server name	Server LU ID	Server data interface ID	Switch data interface name	Switch data interface ID	Storage		Associated virtual mapping ID
						Switch name	Storage data interface ID	
pm1	Server A	LU1	a1	Switch A	s1	Switch A	s4	Storage A
pm2	Server A	LU2	a1	Switch A	s1	Switch A	s6	Storage B
pm3	Server A	LU3	a1	Switch A	s1	Switch A	s3	Storage B

13201 13202 13203 13204 13205 13206 13207 13208 13209 13210 13211 13212

FIG.8

13300

Virtual mapping ID	Server name	Server LU ID	Server data interface ID	Switch data interface name	Switch data interface ID	Storage		Volume ID
						Switch name	Storage data interface ID	
vm1	Server A	LU1	a1	Switch A	s1	Switch A	s4	Storage A
vm2	Server A	LU2	a1	Switch A	s1	Switch A	s4	Storage A
vm3	Server A	LU3	a1	Switch A	s1	Switch A	s3	Storage B

13301 13302 13303 13304 13305 13306 13307 13308 13309 13310 13311 13312

FIG.9

13500

Detection ID	Device type	Device information	IP address	Volume virtualization function	virtualization ID
1	Server	Vendor A, Server A	100.100.100.100	N	N/A
2	Switch	Vendor B, Switch A	100.100.100.101	N	N/A
3	Storage	Vendor C, Storage A	100.100.100.102	Y	N/A
4	Storage	Vendor D, Storage B	100.100.100.103	N	3

FIG.10

23200

Data interface ID	Port WWN	SCSI ID
a1	WWNa1	2

FIG.11

23300

LU ID	Data interface ID	SCSI ID	LUN	Volume information
LU1	a1	2	1	Vendor C, Storage A, va1
LU2	a1	2	2	Vendor C, Storage A, vv1
LU3	a1	2	3	Vendor D, Storage B, vb3

FIG.12

Data Interface ID	Switch Port WWN	Target Port WWN
s1	WWNs1	WWNa1
s2	WWNs2	N/A
s3	WWNs3	WWNd2
s4	WWNs4	WWNc1
s5	WWNs5	WWNc2
s6	WWNs6	WWNd1

33310

33320

33330

33300

FIG.13

	Data interface ID	Port WWN	
(a)	c1	WWNc1	43200
	c2	WWNc2	

	Data interface ID	Port WWN	
(b)	d1	WWNd1	53200
	d2	WWNd2	

FIG.14

	Real Volume ID	Path availability	Data Interface ID	SCSI ID	SCSI LUN
(a)	va1	Y	c1	2	1
	va2	N	N/A	N/A	N/A

	Real Volume ID	Path availability	Data Interface ID	SCSI ID	SCSI LUN
(b)	vb1	Y	d1	4	1
	vb2	Y	d1	4	2
	vb3	Y	d2	2	3

43300

53300

FIG.15

43500

Virtual volume					Real volume				Real volume information
Virtual volume ID	Path	Data interface ID	SCSI ID	LUN	Real data interface ID	SCSI ID	LUN	Real volume information	
vv1	Y	c1	2	2	c2	4	1		Storage B, vb1
vv2	N	N/A	N/A	N/A	c2	4	2		Storage B, vb2

FIG.16

13600

(a)

Failure code	Failure component	Identifier	Cause	Severity
30c1	data interface	c1	data interface malfunction	1
30c2	data interface	c2	data interface malfunction	1
31c1	data interface	c1	Destination access error	4
31c2	data interface	c2	Target access error	4
40vv1	volume	vv1	Volume access error	2
40vv2	volume	vv2	Volume access error	2
...

13600

(b)

Failure code	Failure component	Identifier	Cause	Severity
DATAIFd1	data interface	d1	data interface malfunction	1
Battery1	Battery	Battery1	Battery malfunction	4
...

13600

(c)

Failure code	Failure component	Identifier	Cause	Severity
volvv1	volume	vv1	volume access error	1
volvv2	volume	vv1	volume access error	1
...

13600

(d)

Failure code	Failure component	Identifier	Cause	Severity
Port-s6-Link	data interface	s6	Target access error	8
Port-s5-Hard	data interface	s5	data interface malfunction	1
...

FIG.17

13700

Event ID	Time	Failure device	Failure code	Real volume	Virtual volume	Event relationship
...
1000	2003/01/01 13:10:10	Storage B	DATAIFd1	pm2	vm2	Parent Event
1001	2003/01/01 13:10:20	Storage A	40vv2	pm2	vm2	Child Event
1002	2003/01/01 13:10:30	Server A	Volvv2	pm2	vm2	Child Event
1003	2003/01/01 13:10:35	Switch A	Port-s6-Link	pm2	vm2	Child Event
...
2000	2003/01/02 02:00:00	Storage B	Battery1	pm2	vm2	Parent Event
...
3000	2003/01/03 00:10:10	Storage A	31c2	pm2	vm2	Child Event
3001	2003/01/03 00:10:20	Storage A	40vv2	pm2	vm2	Child Event
3002	2003/01/03 00:10:30	Server A	Volvv2	pm2	vm2	Child Event
3003	2003/01/03 00:10:35	Switch A	Port-s5-Hard	pm2	vm2	Parent Event
...

FIG.18

13800

Common Severity	Storage A Severity	Storage B Severity	Action
1	1	1	Send trap and e-mail with information about Storage A and Storage B
2	2	2, 3	Send trap and e-mail with information about Storage A and Storage B
3	3	4, 5, 6	Send trap and e-mail with information about Storage A
4	4, 5	7, 8, 9, 10	Send trap with information about Storage A

FIG.19

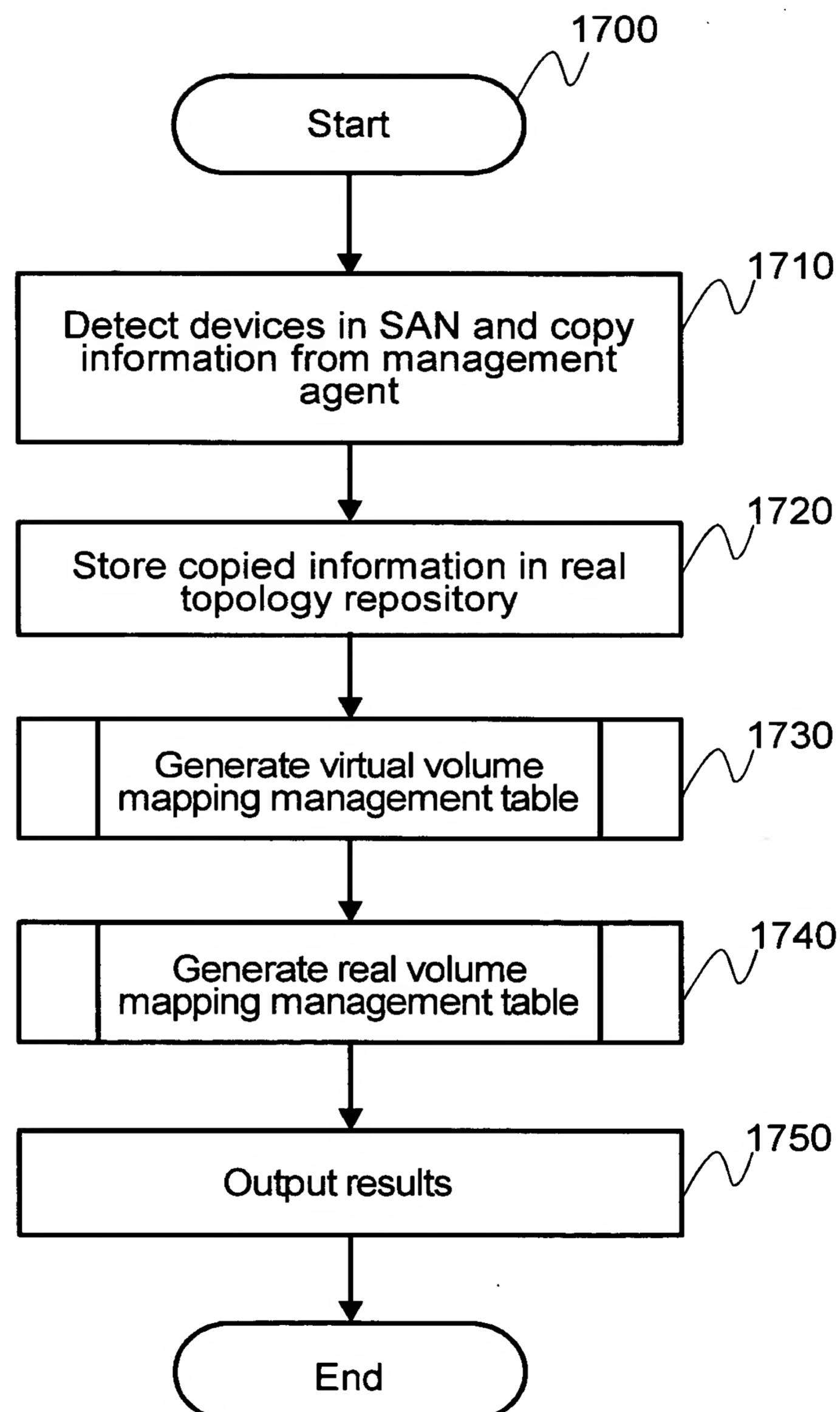


FIG.20

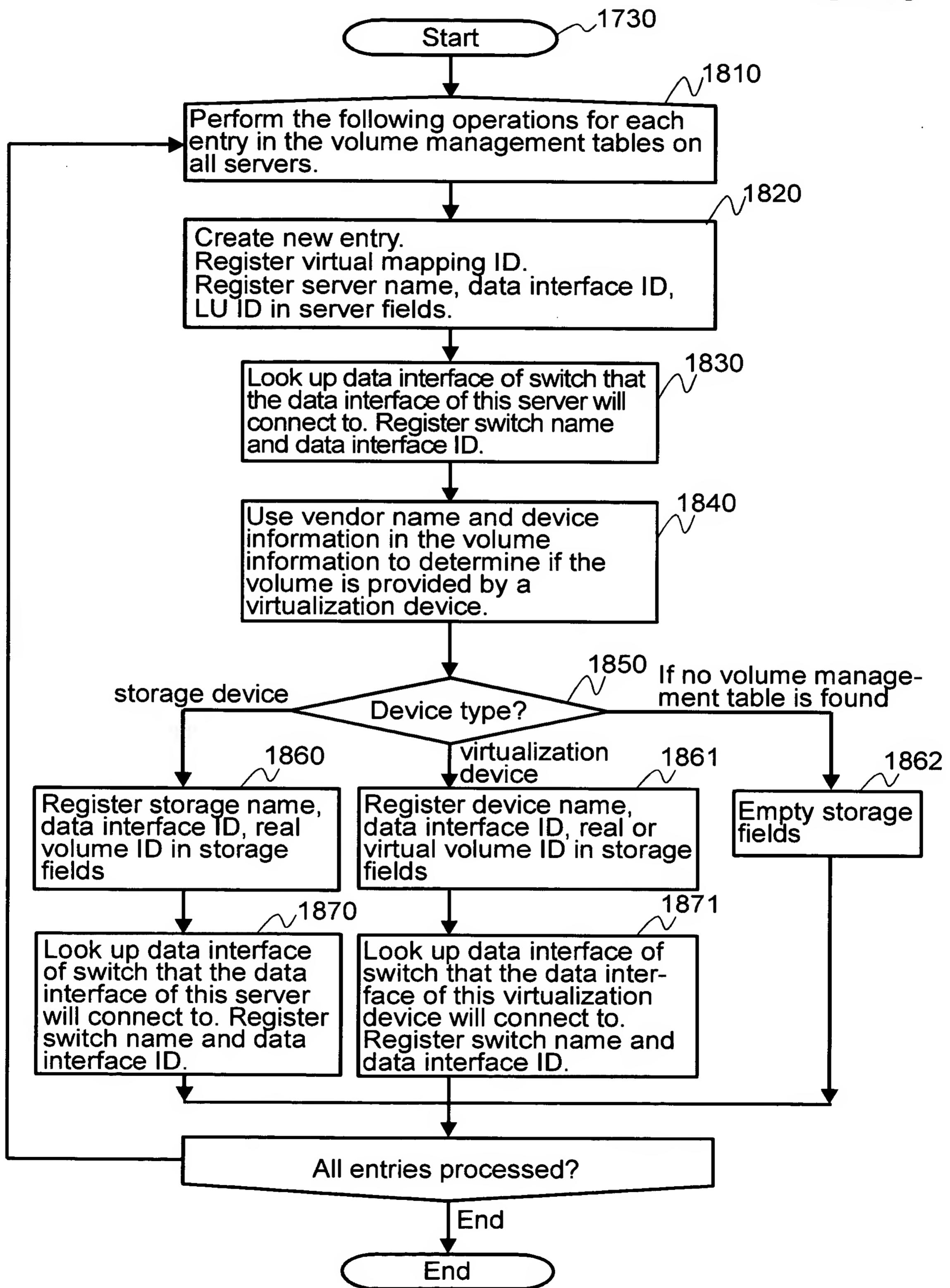


FIG.21

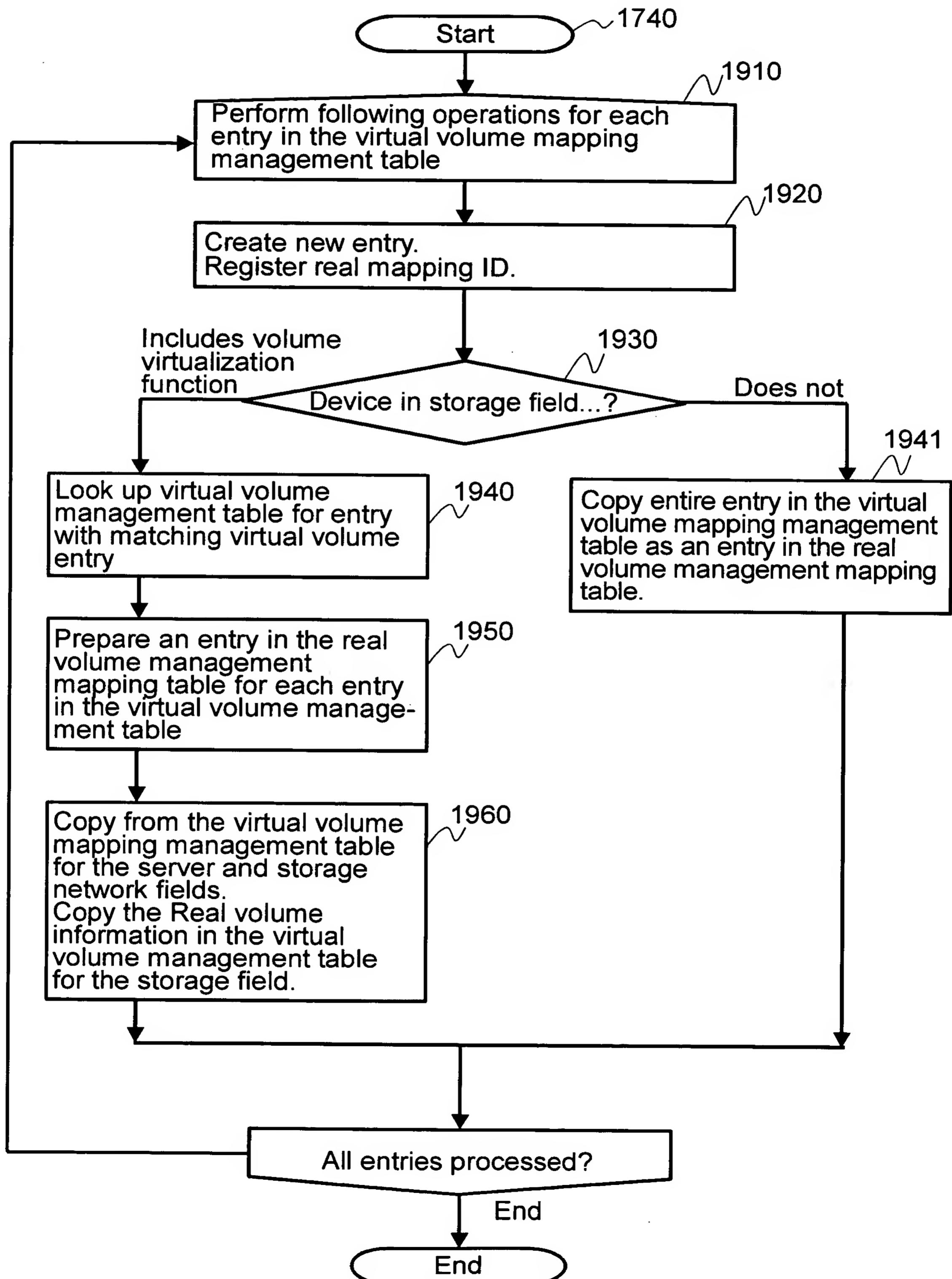
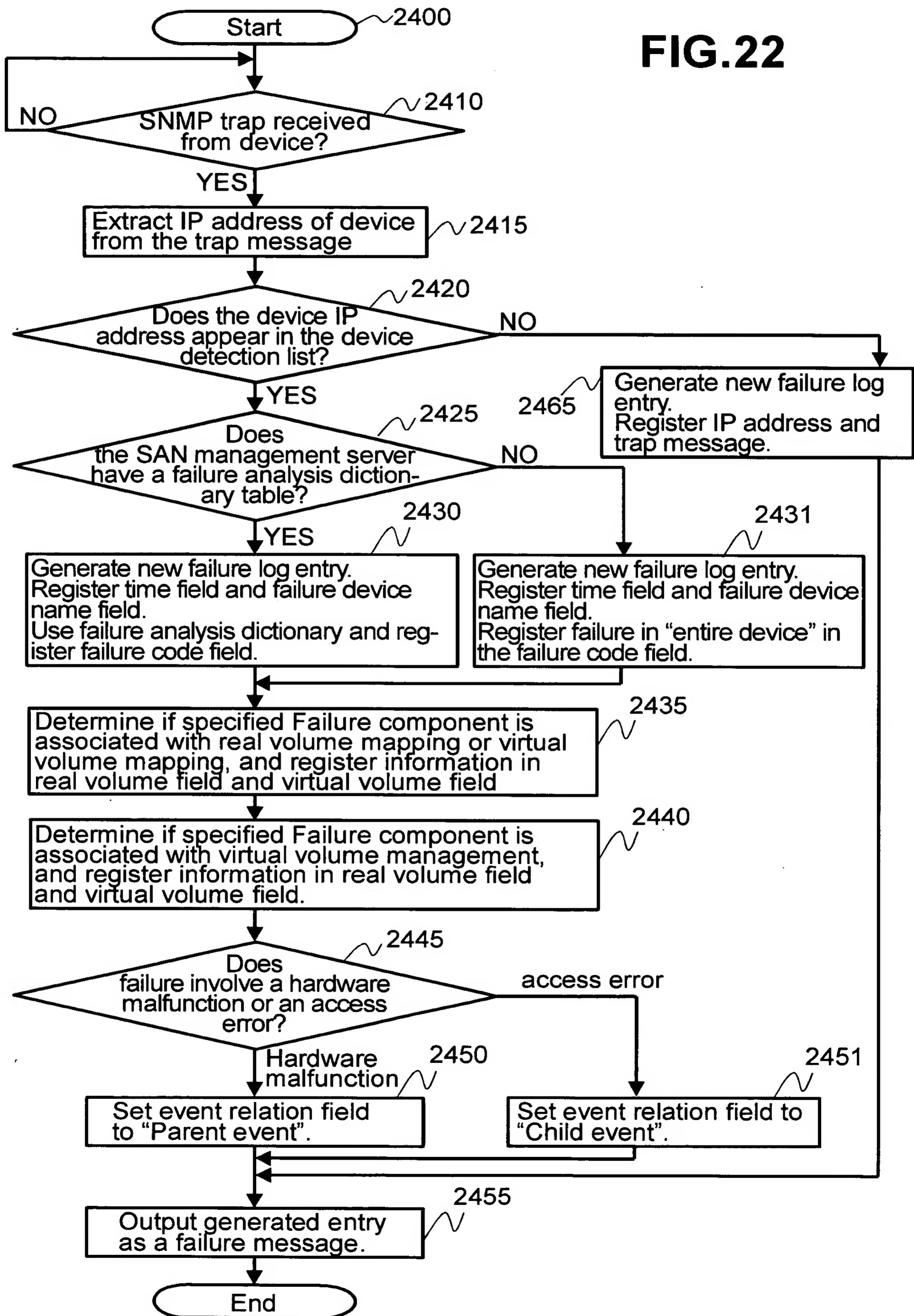


FIG.22



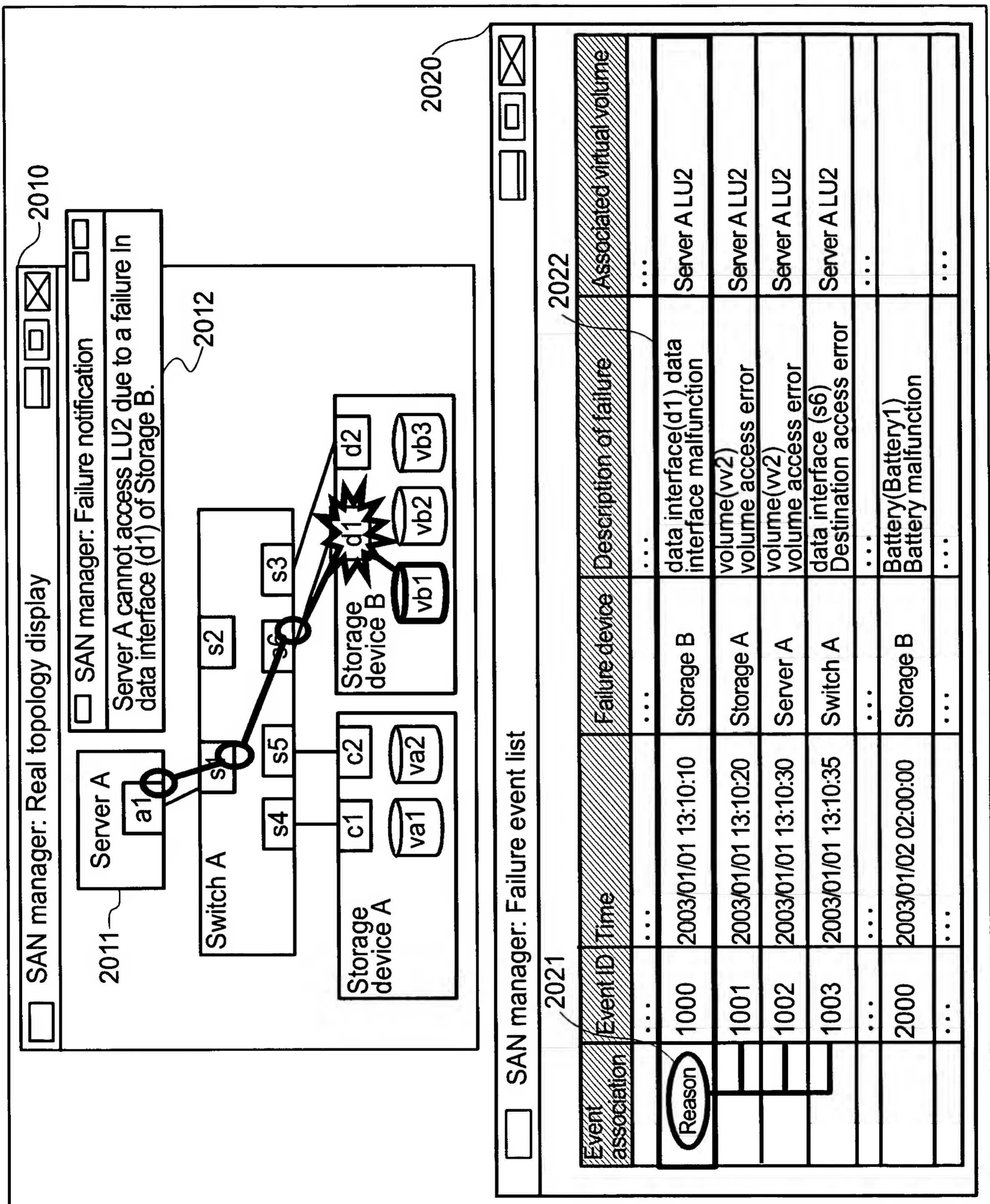


FIG.23

FIG.24

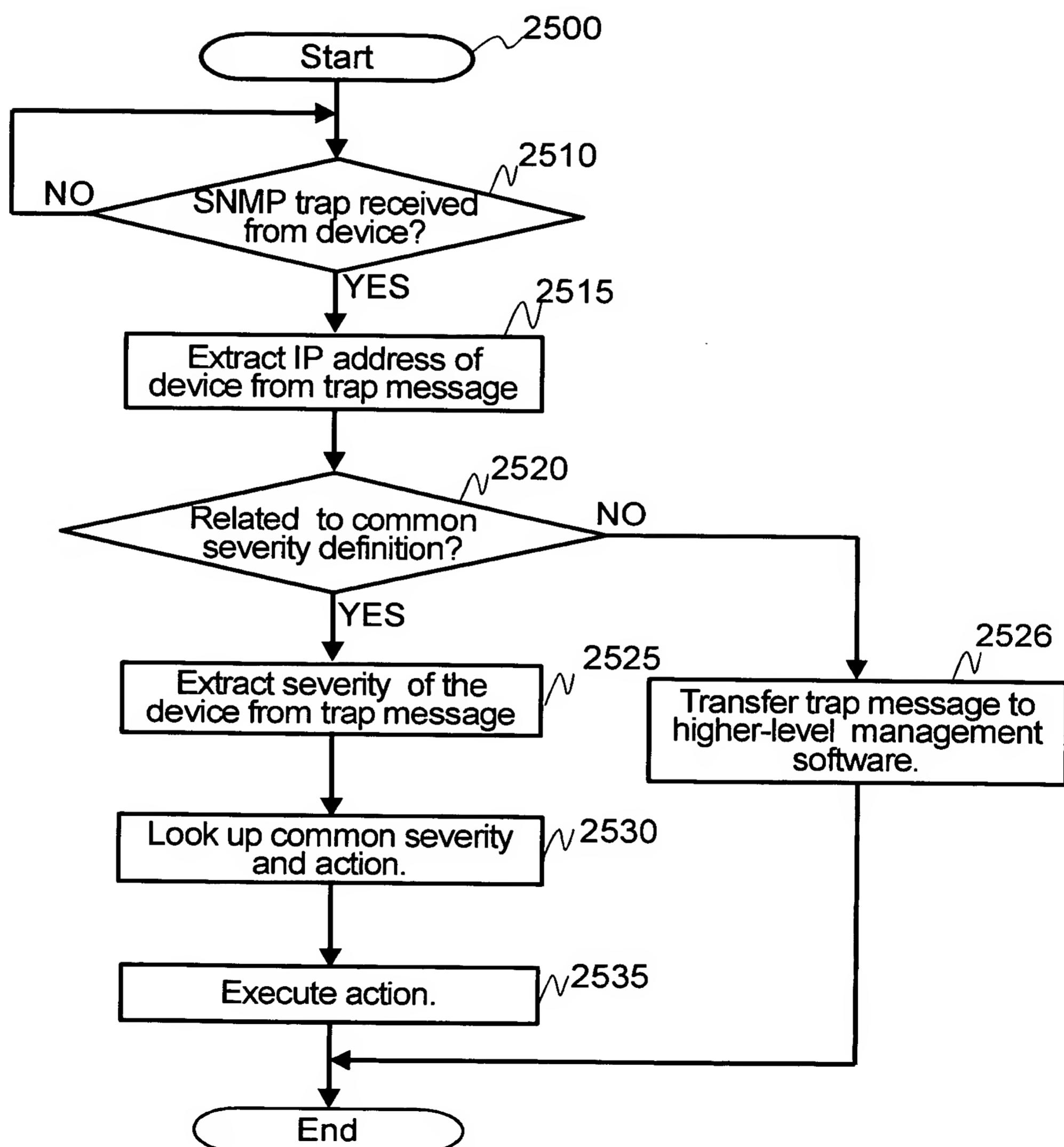
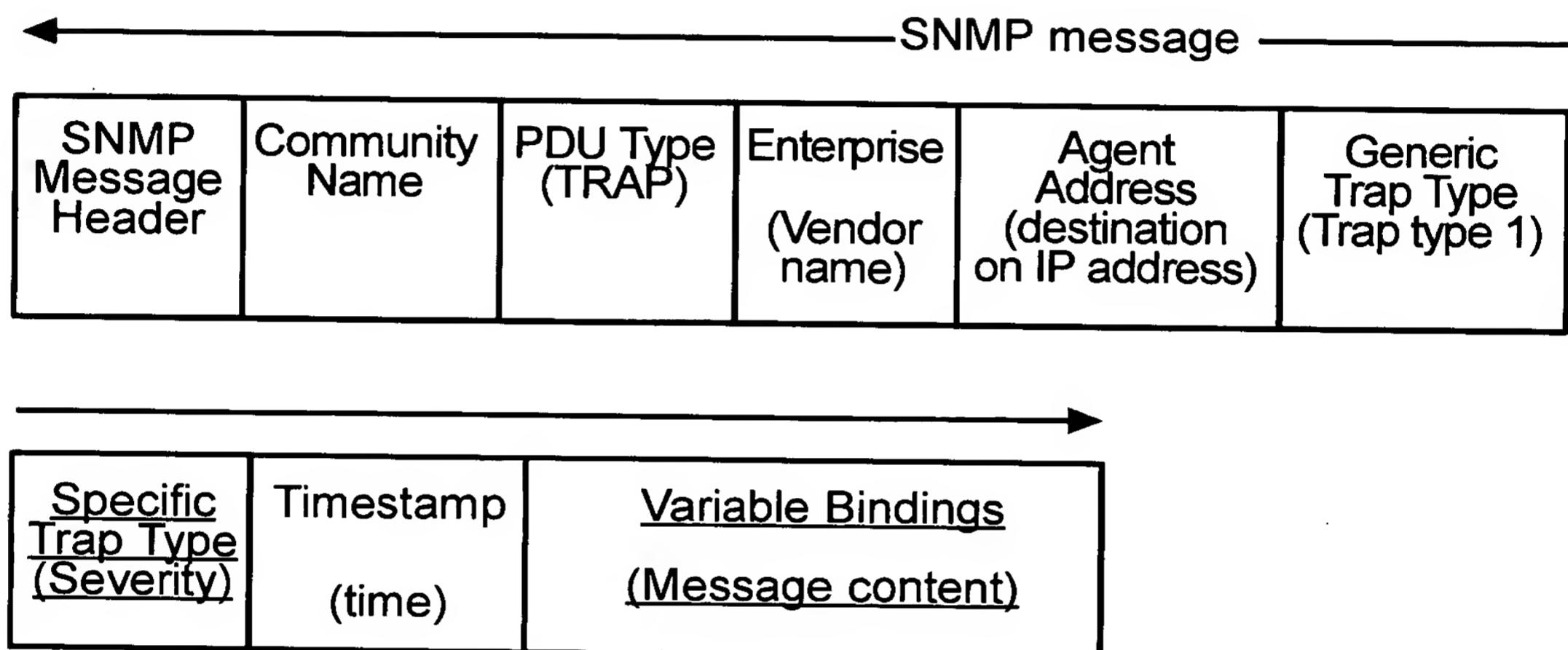


FIG.25

(a) SNMP Trap message format



(b) Sample SNMP Trap message sent by storage device A

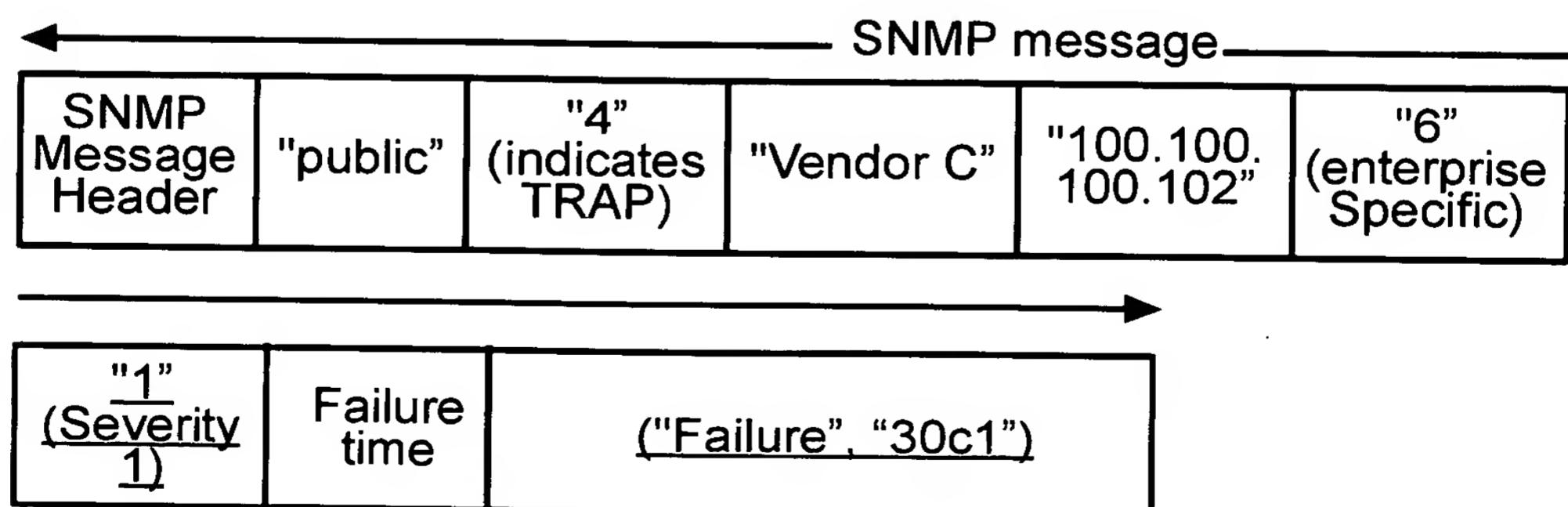


FIG.26

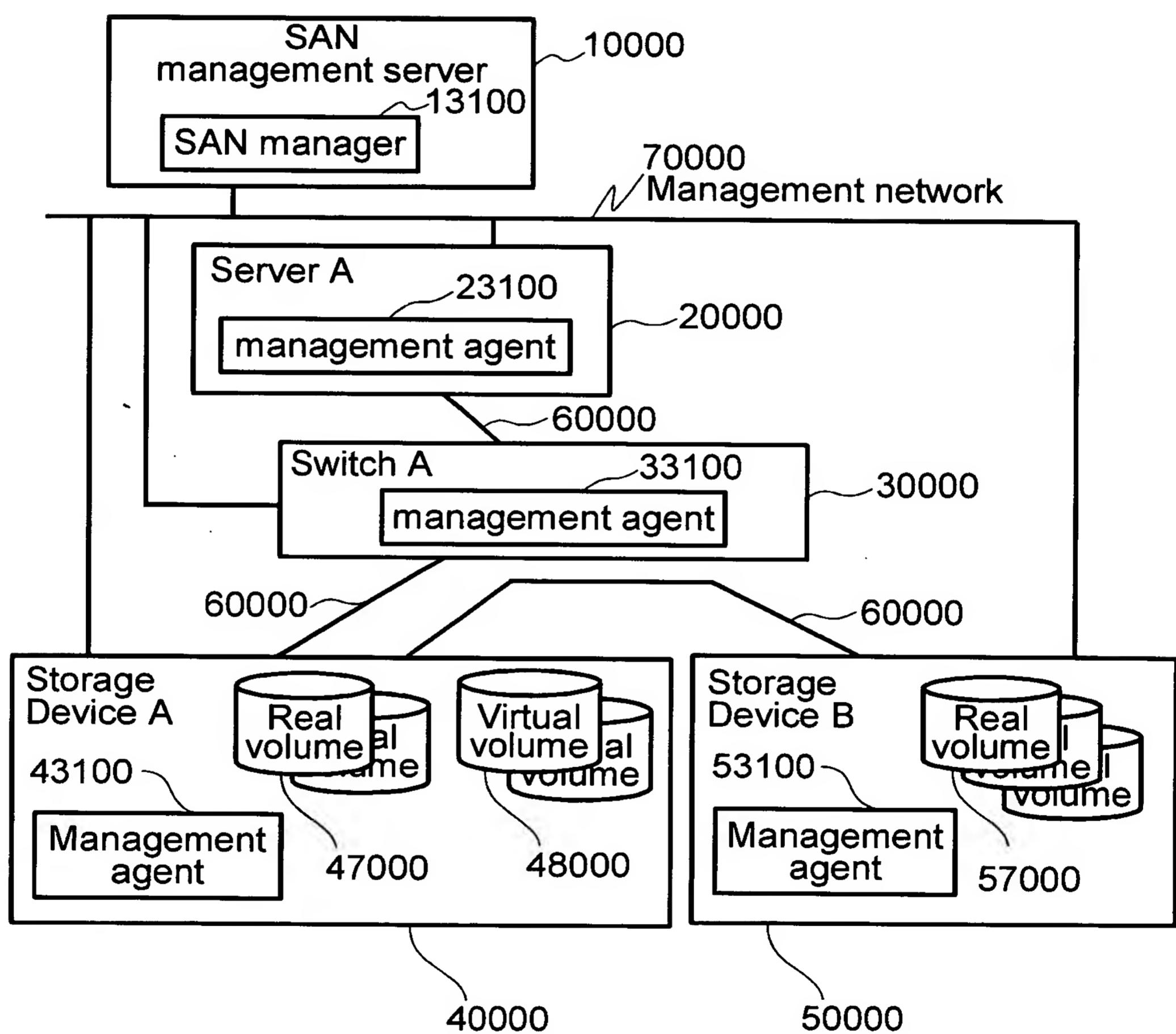


FIG.27

